AIN SHAMS UNIVERSITY
FACULTYOF ENGINEERING
DESIGN AND PRODUCTION ENGINEERING
DEPARTMENT

Utilization of recycled tire composites in engineering products

A thesis Submitted in partial fulfillment of the requirement of the Degree of Master of Science in Mechanical Engineering

By **Kareem Fathy Mohamed Abo El-Enin**

B.Sc.in Mechanical Engineering, 2012

Supervised by

Prof. Dr. M. Hazem Abd EL-Latif

Dr. Ayman Abdel-Wahab

Cairo - 2016

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FACULTY OF ENGINEERING

Design and Production Engineering

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STATEMENT

This thesis is submitted in partial fulfillment of Master of Science degree in mechanical engineering, Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of this thesis has been submitted for a degree or qualification at any other scientific entity.

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SUMMARY

The objective of this research is the utilization of waste tire rubber to get novel polypropylene composite materials of satisfactory properties to suit various applications.

Treatment of waste tire rubber particles is done by H_2So_4 to enhance the adhesion at the interface between the waste tire rubber particles and the PP matrix that affects the properties of resulted composites.

Optimum composition of the composite is selected by studying various rubber particles weight percentage 5%, 10%, 20%, 30%, 40% and 50% and by using different rubber particle sizes.

The physical properties such as water absorption and mechanical properties such as bending strength, elastic modulus, compressive yield strength, hardness and impact strength are studied for the PP-waste tire rubber particles composites and the optimum composition of the composite is selected to suit certain engineering application. Also, dimensional stability of composite of the highest impact strength is studied.

Investigation of the fracture surface of the specimen is done using SEM to evaluate the interface between rubber particles and polypropylene.

Keywords: Recycling of tires, waste tire rubber particles, Polypropylene, Composite, Mechanical properties for composites.

<u>ACKNOWLEDGEMENT</u>

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability to proceed successfully. This thesis appears in its current form due to the assistance and guidance of several people. I would therefore like to offer my sincere thanks to all of them.

Many cordial thanks for accepting me as a Master student, your warm encouragement, thoughtful guidance, critical comments, and correction of the thesis, **Prof. Dr. M. H. Abd El-Latif**, professor of Production Engineering, Faculty of building, Ain Shams University.

I am just as much indebted to **Dr. Ayman Aly Abdel wahab, Dr. Ramdan El-Gamasy, Eng. Ahmed Hassan, Eng. Hassan El-Hadad, Eng.** because of you all this was achieved thanks a lot for your support.

A special measure of appreciation is extended for my lovely wife **Eng. Bassant Hany,** Ain Shams University. Without her nothing of this would see the sun, she is very intelligent, supportive, reliable, and over this entire mother of my son **Mounir**, god bless both of them.

A special thank for **My Father & mother: Fathy Mohamed, Eman Abdallah,** your efforts supporting me in whole life is the reason what I am now any words can't describe what my feelings toward you.

Also, my mother in Law she is a marvels person that can gave her life just to make us happy god bless you **Dr. Fayka–Abdel hamid, Eng. Sherif Hany and Dr. Yassmine El-kashef** for their encouragement and support.

List of abbreviations

E	Young's modulus or elastic modulus.
GTR	Ground tire rubber
CPR	Composite of PP and GTR
PP	Polypropylene.
TMA	Thermo mechanical analysis
DSC	Differential scanning calorimetry
FTIR	Fourier transformation
Wt.%	Weight percent
CTE	Coefficient of thermal expansion
TDF	Tire derived fuel
U CPR	Untreated GTR-PP composite
T CPR	Treated GTR-PP composite

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